Bed epilepsy sensors

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Bump in the night
Bed epilepsy sensors

Chairman of the Telecare Services Association, Malcolm Fisk, offers his view of the benefits brought by assistive technologies

In accommodating people's medical needs in new ways, assistive technologies are making an increasing contribution in the home. Under that umbrella term, we can count a huge array of sensors and other devices with a range of applications. In the case of epilepsy, possibly the most useful examples of assistive technology are known as telecare and telehealth.

Telecare can be defined as any kind of monitoring device or equipment that assists vulnerable people at home. Meanwhile, telehealth is the use of any telecommunication device to deliver health-related services or information. While that might be as simple as two doctors discussing treatment over the phone, telehealth is often much more high-tech.

With regard to seizures, there is a growing interest in bed epilepsy sensors. Sometimes supplementing these – depending on individual needs – are fall detectors and automated devices or prompts for medication compliance. In combination, telecare and telehealth may provide useful support in people's homes. For instance, a telecare sensor can detect when a person has a seizure at home. When the sensor detects the epileptic event, automated communications devices can call for help – helping ensure the person's safety. These technologies may also improve independence, helping someone that may usually require supervision to live alone.

What do they do?

At the heart of telecare services are monitoring centres. These centres handle the automated calls triggered by epilepsy sensors and process the information they send. The monitoring centres have roles that relate to the following.

- Recognising and responding to events – using simple social alarms (triggered by pressing a button), or fall and seizure detectors.
- Supporting medication compliance or concordance – using pill dispensers or pagers.
- Monitoring wellbeing – using a variety of tools, ranging from simple timers through to activity and vital signs devices and telephone support.

Evaluation

There are currently over 100 accredited telecare services in the UK. Probably a third of those services have some experience of bed epilepsy sensors. Only one evaluation of the use of bed epilepsy sensors in the community is known to have been done. This was within a service that operates throughout the Republic of Ireland. The evaluation was funded by Brainwave: The Irish Epilepsy Association and Fold Ireland.

There are no other known evaluations in community settings. A limited evaluation of bed epilepsy sensors in a New York hospital has, however, been published in the epilepsy journal *Seizure*, in April 2009. The researchers in this study cautiously pointed to a positive role for such devices for patients with a history of tonic-clonic seizures. They also, however, called for further study.

How do they work?

Four manufacturers of bed epilepsy sensors currently have equipment available in the UK. They operate in similar ways, normally with a pad or similar sensor device that is placed below the mattress in order to detect tonic-clonic seizures. Responding to one or more measures enables seizures to be reliably recognised. The sensor may respond to several different signifiers, such as movement, noise, respiration and heartbeat.

All the bed epilepsy sensors offer a means of adjusting their sensitivity. This is an important issue for users, carers and installers. Adjustments (post-installation) are normally required in order to find a setting that 'captures' tonic-clonic seizures, while minimising the number of false alarms.

If a sensor is triggered, it will first wait for a short period of time. This delay is adjustable by the user, and is designed to reduce false alarms. It allows the user to disable the alarm before help is requested if they have triggered it accidentally. If the alarm is not disabled, a signal is sent through a hard-wired or radio link to an alert device – perhaps waking a carer. Alternatively it can be routed through a carephone that will automatically dial out to a monitoring centre.

None of the manufacturers make any claims about the recognition of seizures, other than tonic-clonic seizures. These sensors may not be useful for other seizure types, where any signs of seizure activity may simply be too subtle to be detected by an electronic device.

The Fold Ireland service

In the Republic of Ireland there are some 30,000 to 40,000 people with epilepsy. In early 2008, there were 45 users of the Fold Ireland telecare service. Each was provided with bed epilepsy sensors, carephones and pendant radio triggers. Some also had fall detectors.

An evaluation of this service was done, which included personal interviews in the Dublin and Cork areas, supplemented by postal surveys. The main evaluation findings were based on 23 responses. These responses were from both adults with epilepsy or the parents or carers of a person with epilepsy who was unable to complete the evaluation form.

A majority of respondents (19 of 23) regarded the devices as having a positive effect on their lives. Counterbalancing these were some concerns relating to the sensitivity of sensors and – as a result – accidental activations. Overall, all but one of the 15 adult users reported 'feeling safer' after having the bed epilepsy sensor and other telecare devices installed in their homes.

Although this evaluation is a relatively small piece of work, I think the positive result shows that telecare and telehealth equipment is worthy of more study. There are many positive aspects to the role played by bed epilepsy sensors in promoting safety and independence. Generally speaking, the above study showed that – by and large – this application of assistive technologies was met with enthusiasm. Nineteen of 22 study participants agreed that their independence, or that of a child, had improved as a result of their assistive devices.

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User testing

Richard (aged 9)

Richard has regular simple partial and tonic-clonic seizures. His mother had little sleep before the bed epilepsy sensor was fitted. She worried that something might happen to Richard during the night. The device helped the whole family to sleep and feel more relaxed.

Jane (aged 37)

Jane's tonic-clonic seizures occur once or twice a week. She has a bed epilepsy sensor and wears a fall detector. The devices have been of great benefit to Jane, who is at home on her own with her two sons. She used to worry about what might happen to her children, but now has a greater sense of security.

Siobhan (aged 22)

Siobhan has moderate learning disabilities and experiences several different types of seizures. Although she has the bed epilepsy sensor, fall detector, pendant trigger and carephone, Siobhan gets an 'aura' [a warning of an impending seizure] before seizures. This gives her time to call for help and undermines the usefulness of the telecare service.

Brendan (aged 29)

Brendan has frequent sleep-related seizures. He feels 'safe and secure' with the carephone and pendant, bed epilepsy sensor and fall detector. Brendan's concern is the sensitivity of the bed epilepsy sensor. This was adjusted to prevent false alarms, but then it was not triggered by real seizures. He would like the technologies to be less sensitive, but still effective.

Further reading

Carlson C, Arnedo V, Cahill M and Devinsky O. *Detecting Nocturnal Convulsions: Efficacy of the MP5 Monitor. Seizure* 18 2009